REMARKS

Claims 1-6, 8-19, 21-31, and 33-37 are all the claims presently pending in the application. Claims 14-19 and 21-25 are amended to more clearly define the invention. Claims 1, 14, and 26 are independent.

These amendments are made only to more particularly point out the invention for the Examiner and not for narrowing the scope of the claims or for any reason related to a statutory requirement for patentability.

Applicants also note that, notwithstanding any claim amendments herein or later during prosecution, Applicants' intent is to encompass equivalents of all claim elements.

Claims 1-6, 8-9, 12-19, 21-22, 25-31, 33-34, and 37 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over the Bergman et al. reference in view of the Li et al. reference. Claims 10-11, 23-24, and 35-36 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over the Bergman et al. reference in view of the Li et al. reference and further in view of the Li et al. reference [2].

These rejections are respectfully traversed in the following discussion.

I. THE CLAIMED INVENTION

An exemplary embodiment of the claimed invention, as defined by, for example, independent claim 1, is directed to a method for storing a semantic object derived from geological seismic survey data. The method includes summarizing attributes of the semantic object, indexing the summary of attributes, and storing the summary of attributes and the index of the summary of attributes. The summary of attributes includes one of a slice label, a signal strength, and a coordinate of a surveyed segment.

Conventionally geological seismic survey data has been visualized to assist geologists in tasks, such as for constructing three dimensional reservoir models. This data may be used to directly create images that may be viewed. These images may be annotated and saved. However, the amount of this seismic survey data is very large and it is very difficult to search and analyze the data in order to identify seismic regions that have geological characteristics which are interesting to geologists. Such enormous amounts of data make it very difficult for a

geologist to identify features in the geology that is being visualized.

Additionally, the amount of data that is collected has so far outpaced the ability for conventional systems to store the data.

In stark contrast, the present invention provides a semantic object from geological seismic survey data, summarizes, indexes, and stores attributes of the semantic object. In this manner, the geological seismic survey data may be analyzed much more efficiently and easily.

II. THE 35 U.S.C. § 101 REJECTION

The Examiner alleges that claims 1-6, 8-19, 21-31, and 33-37 are directed to non-statutory subject matter because the claims do not require any physical transformation and that the invention as claimed does not produce a useful and tangible result.

> "In evaluating whether a claim meets the requirements of section 101, the claim must be considered as a whole to determine whether it is for a particular application of an abstract idea, natural phenomenon, or law of nature and not for the abstract idea, natural phenomenon, or law of nature itself." (M.P.E.P. 2106.IV.C)

Clearly, the claims are not directed to a natural phenomenon or law of nature as there is no such natural phenomenon or law of nature which stores a summary of attributes of a semantic object that is derived from geological seismic survey data and an index of the summary of attributes, where the summary of attributes includes a slice label, signal strength, or a coordinate of a surveyed segment as recited by the claims.

Further, the claims are not directed to a mere abstract idea, but rather is directed to a practical application of an abstract idea. In particular, the claims are directed to storing a summary of attributes of a semantic object that is derived from geological seismic survey data and an index of the summary of attributes, where the summary of attributes includes a slice label, signal strength, or a coordinate of a surveyed segment.

The utility requirement provides that the utility of an invention must "distinguish the claim from the three 35 U.S.C. 101 judicial exceptions to patentable subject matter by specifically reciting in the claim the practical application." (M.P.E.P. 2106.IV.C.2.(2)(a)).

The judicial exceptions include abstract ideas, laws of nature, and natural phenomena.

Each of independent claims 1, 14, and 26 recite storing a summary of attributes of a semantic object that is derived from geological seismic survey data and an index of the summary of attributes, where the summary of attributes includes a slice label, signal strength, or a coordinate of a surveyed segment.

Clearly this invention is useful because the storage of summarized attributes of semantic objects that are derived from geological data and the index to the summarized attributes, as claimed, enables a user to search and/or analyze the geological seismic survey data more easily and quickly. In this manner, the claimed invention clearly has a useful practical application and is not an abstract idea, a law of nature, nor a natural phenomena.

> "The tangible requirement does not necessarily mean that a claim must either be tied to a particular machine or apparatus or must operate to change articles or materials to a different state or thing. However, the tangible requirement does require that the claim must recite more than a 35 U.S.C. 101 judicial exception, in that the process must set forth a practical application of that judicial exception to produce a real-world result. . . . It is for the discovery or invention of some practical method or means of producing a beneficial result or effect, that a patent is granted." (M.P.E.P. 2106.IV.C.2.(2)(c)).

As explained above, each of independent claims 1, 14, and 26 recite storing a summary of attributes of a semantic object that is derived from geological seismic survey data and an index of the summary of attributes, where the summary of attributes includes a slice label, signal strength, or a coordinate of a surveyed segment.

Clearly, the claimed invention provides a method for producing a beneficial result or effect, in that the claimed invention provides for the storage of summarized attributes of semantic objects that are derived from geological data and the index to the summarized attributes, as claimed, enables a user to search and/or analyze the geological seismic survey data more easily and quickly. In this manner, the claimed invention clearly has a useful practical application and is not an abstract idea, a law of nature, nor a natural phenomena.

With respect to the rejection of claims 14-25, to speed prosecution, claims 14-25 have

been amended in accordance with Examiner Pham's very helpful suggestions.

The Examiner also alleges that claims 26-37 are directed to software per se and alleges that software per se does not fall into any of the categories of patentable subject matter.

Contrary to the Examiner's allegations, claims 26-37 are not directed to software per se. Rather, independent claim 27 clearly recites a system for storing a semantic object. The system includes a semantic object summarizer that summarizes attributes of a semantic object derived from geological seismic survey data, an indexer that indexes the summarized attributes, and a database that stores the summary of attributes and the index of the summary of attributes. The summary of attributes includes one of a slice label, a signal strength, and a coordinate of a surveyed segment.

Further, contrary to the Examiner's allegation, there is no per se rule against the patentability of software.

Indeed, any claim that is limited to a machine or manufacture, which has a practical application, like each of claims 26-37, is statutory. There is no per se bar to patentability of software related claims unless such claims fail to satisfy the practical application requirement. Claims 26-37 clearly recite functional descriptive material which satisfies the practical application requirements as explained above.

Should the Examiner continue to allege that claims 26-37 are non-statutory as being directed to software which is non-patentable per se, Applicants respectfully request that the Examiner specifically support the Examiner's allegations through citations.

Applicants respectfully request withdrawal of this rejection.

III. THE PRIOR ART REJECTIONS

A. The Bergman et al. reference

Regarding the rejection of claims 1-6, 8-9, 12-19, 21-22, 25-31, 33-34, and 37, the Examiner alleges that the Bergman et al. reference teaches the claimed invention. Applicants submit, however, that there are elements of the claimed invention which are neither taught nor suggested by the Bergman et al. reference.

As explained previously, none of the applied references teaches or suggests the features

of the claimed invention including summarizing, indexing, and storing attributes of a semantic object derived from geological seismic survey data. These features are important for efficiently and easily analyzing geological seismic survey data.

Rather, the Bergman et al. reference discloses processing data from a Formation Micro-scanner Imager (FMI) that detects variations in electrical resistivity of the sides of a borehole, as well as, from archives of petroleum well-bore data. In other words, the data that is disclosed by the Bergman et al. reference is all acquired from discrete points within bore holes, resulting in cylindrical surface (from FMI) and a one-dimensional series for log data.

In stark contrast, the present invention summarizes, indexes, and stores attributes of semantic objects that are derived from geological seismic survey data. Seismic survey data is collected and interpolated over a large volume of space by reflections of elastic waves propagating through the earth.

Geologic seismic data is the primary way in which exploration for fossil fuels is conducted. Well log and FMI data are used merely for fine-tuning the areas which are identified by the seismic data as being promising. Therefore, the present invention provides great benefits by making it possible to efficiently analyze seismic data, which has, heretofor, not been possible.

Clearly, the Bergman et al. reference does not teach or suggest summarizing, indexing, and storing attributes of semantic objects that are derived from geological seismic survey data.

Indeed, the Examiner admits that "The missing of Bergman is geological seismic survey data." (page 4, lines 14-15).

Therefore, the Bergman et al. reference does not teach or suggest each and every element of the claimed invention and the Examiner is respectfully requested to withdraw this rejection of claims 1-9, 12-22, 25-34, and 37.

B. The Bergman et al. reference in view of the Li et al. reference [1]

Regarding the rejection of claims 1-6, 8-9, 12-19, 21-22, 25-31, 33-34, and 37, the Examiner alleges that the Li et al. reference [1] would have been combined with the Bergman et al. reference to form the claimed invention. Applicants submit, however, that these references would not have been combined and, even if combined, the combination would not teach or

suggest each and every element of the claimed invention.

None of the applied references teaches or suggests the features of the claimed invention including summarizing, indexing, and storing attributes of a semantic object derived from geological seismic survey data. These features are important for efficiently and easily analyzing geological seismic survey data.

As explained above, the Bergman et al. reference does not teach or suggest these features.

The Li et al. reference [1] does not remedy these deficiencies.

Rather, and in stark contrast, the Li et al. reference [1] discloses how the selection of optimal texture features for texture feature based similarity retrieval is highly application dependent. While the Li et al. reference [1] discloses that seismic data may be used for petroleum exploration, the Li et al. reference [1] does not teach or suggest that texture feature based similarity retrieval has anything at all to do with seismic data.

The Li et al. reference [1] merely presents a list of many different types of non-structured data in an introductory section as examples of data which may be used for knowledge discovery and decision support for various business processes.

The Li et al. reference [1] then explains that they are not concerned with all of these different types of data. To the contrary, the Li et al. reference [1] makes it clear that "our focus is to perform similarity retrieval of core images from rock samples based on texture features." (page 3).

The Examiner alleges that the Li et al. reference [1] teaches that geological seismic survey data (as claimed) "is an inherited feature for generating texture features." However, contrary to the Examiner's allegation, texture feature sets are completely different and are entirely unrelated to seismic data.

Texture features are only useful for interpreting images. Texture features in geology refer to the physical appearance or character of a rock, such as grain size, shape, and arrangement at both the megascopic or microscopic surface feature level. This includes the geometric aspects and relations among the component particles or crystals which is called the crystallographic texture or preferred orientation. The term structure is generally used for larger features. Texture features are not useful for interpreting geologic seismic data.

The Examiner also alleges that "obviously geological seismic survey data . . . .is used to generate texture features." While it may be possible to generate texture features using geological seismic survey data, geological seismic survey data is not used to generate texture features because such texture features are not useful.

If the Examiner intends to continue to allege that "obviously geological seismic survey data . . . .is used to generate texture features" the Applicants hereby demand that the Examiner provide evidence supporting such an allegation

Applicants' note that the Examiner does not provide an support for this allegation. Should the Examiner continue to allege that geological seismic survey data is used to generate texture features, Applicants respectfully request that the Examiner comply with 37 C.F.R. §1.104(c)(2) which requires that "the particular part relied on must be designated as nearly as practicable. The pertinence of each reference, if not apparent, must be clearly explained and each rejected claim specified." In this instance, the Examiner failed to cite the particular portion of any applied reference which may have been relied upon.

Further, with respect to claims 12, 25, and 37, the Examiner alleges that the Bergman et al. reference discloses the confidence level represents a degree of accuracy of classification for the semantic object. Contrary to the Examiner's allegation, the Bergman et al. reference does not teach or suggest this feature.

Rather, the Bergman et al. reference discloses similarity scores. Similarity scores and confidence levels are substantially different things. A similarity score is the result of comparing two objects, two arbitrary individuals, to each other, and summarizing the differences. A confidence-in-classification level is the result of comparing one object to an abstract class in some arbitrary manner. This might entail comparing the object to every individual previously known to be in that class, or it might be a rule based approach. Further, groups of individuals might form multiple clusters inside a class. For example, the similarity score between a Chihuahua and a Doberman might be very low, (depending upon the features chosen to compare) but the confidence in their classification as dogs would be equal i.e., 100 percent for each.

Additionally, the Examiner has failed to present a *prima facie* case for obviousness. In particular, the Examiner fails to provide any suggestion or motivation for modifying the

Bergman et al. reference based upon the Li et al. reference [1].

Section 2142 of the MPEP states:

> "To establish a prima facie case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings." (Emphasis added).
>
> "The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in applicant's disclosure." (M.P.E.P. § 2143.01).

Indeed, the Examiner does not even attempt to provide any suggestion or motivation at all.

Clearly, the Examiner has failed to present a *prima facie* case for obviousness.

Further, it is very clear that there has been a long-felt and significant need for more efficient processing of seismic data because of the significant interest and benefits in finding new sources for fossil fuel. Until the present invention, no such method for efficient processing of seismic data has been provided. Clearly, this long-felt, yet unsatisfied need indicates that it would not have been obvious to those of ordinary skill in the art.

Therefore, the Examiner is respectfully requested to withdraw the rejection of claims 1-6, 8-9, 12-19, 21-22, 25-31, 33-34, and 37.

C. The Bergman et al. reference in view of the Li et al. reference [1] and in further view of the Li et al. reference [2]

Applicants note that the Examiner refers to "Smith et al. [A Framework for Mining Sequence Database at Multiple Abstraction Levels]." However, the reference that is entitled "A Framework for Mining Sequence Database at Multiple Abstraction Levels" is not authored by anyone named Smith. Rather, this reference is authored by Li et al. For the purposes of this rejection, Applicants will refer to this reference as the Li et al. reference [2].

Regarding the rejection of claims 10-11, 23-24, and 35-36, the Examiner alleges that the Li et al. reference [1] would have been combined with the Bergman et al. reference and further alleges that the Li et al. reference [2] would have been combined with the Bergman et al.

reference and the Li et al. reference [1] to form the claimed invention. Applicants submit, however, that these references would not have been combined and, even if combined, the combination would not teach or suggest each and every element of the claimed invention.

None of the applied references teaches or suggests the features of the claimed invention including summarizing, indexing, and storing attributes of a semantic object derived from geological seismic survey data. These features are important for efficiently and easily analyzing geological seismic survey data.

As explained above, neither the Bergman et al. reference nor the Li et al. reference [1] teaches or suggests these features.

The Li et al. reference [2] does not remedy these deficiencies.

Rather, and in stark contrast, the Li et al. reference [2] discloses performing similarity searches on time series objects (or segments), such as, for example, company growth patterns, product selling patterns, stock price movements, weather patterns, geological features, environmental pollution, astrophysical patterns, and the like. All of the objects that are processed by the Li et al. reference are time-domain based.

In stark contrast, the present invention summarizes indexes, and stores attributes of semantic objects that are derived from geological seismic survey data which includes space-based objects.

Additionally, the Examiner has yet again failed to present a *prima facie* case for obviousness. In particular, the Examiner fails to provide any suggestion or motivation for modifying the Bergman et al. reference based upon the Li et al. reference [1].

Section 2142 of the MPEP states:

> "To establish a prima facie case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings." (Emphasis added).
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> "The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in applicant's disclosure." (M.P.E.P. § 2143.01).

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all.

Clearly, the Examiner has failed to present a *prima facie* case for obviousness.

Further, it is very clear that there has been a long-felt and significant need for more efficient processing of seismic data because of the significant interest and benefits in finding new sources for fossil fuel. Until the present invention, no such method for efficient processing of seismic data has been provided. Clearly, this long-felt, yet unsatisfied need indicates that it would not have been obvious to those of ordinary skill in the art.

Therefore, the Examiner is respectfully requested to withdraw the rejection of claims 10-11, 23-24, and 35-36.

IV. FORMAL MATTERS AND CONCLUSION

In view of the foregoing amendments and remarks, Applicants respectfully submit that claims 1-6, 8-19, 21-31, and 33-37, all the claims presently pending in the Application, are patentably distinct over the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue at the earliest possible time.

Should the Examiner find the Application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary in a telephonic or personal interview.

The Commissioner is hereby authorized to charge any deficiency in fees or to credit any overpayment in fees to Attorney's Deposit Account No. 50-0510.

Respectfully Submitted,

/_____/

James E. Howard
Registration No. 39,715

McGinn Intellectual Property Law Group, PLLC
8321 Old Courthouse Rd., Suite 200
Vienna, Virginia 22182
(703) 761-4100
Customer No. 21254